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UNIVERSITÉ JEAN MONNET SAINT-ÉTIENNE

Centre Hospitalier Universitaire Saint-Etienne

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Image processing and analysis: the basis

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What is an image?

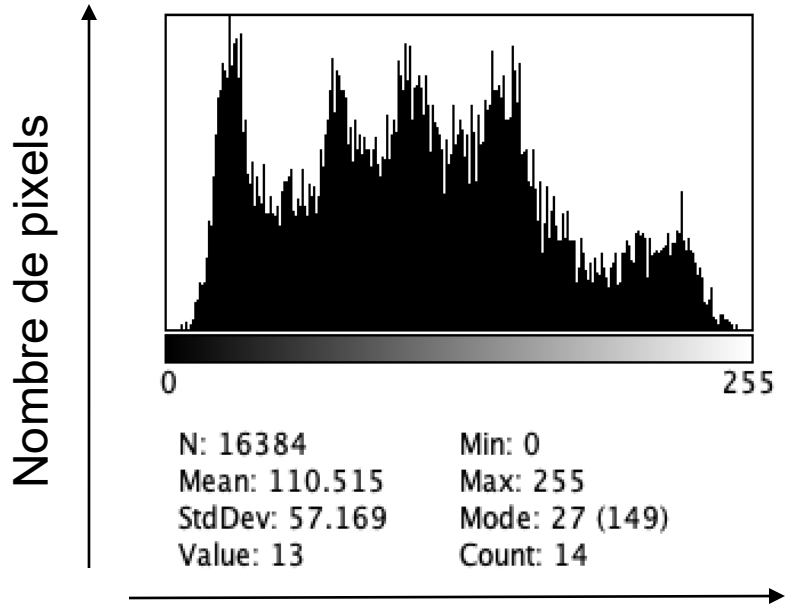
- **Caractéristiques d'une image**

Image Lena

Dimensions: 128x128
Résolution: x mm X y mm
Codage: 8bits
Taille: 128x128 Octets=16384Octets=16KOctets

- **Sous Fidji**
  - Title: FFT of lena128-1.png
  - Width: 128 pixels
  - Height: 128 pixels
  - Size: 16K
  - Pixel size: 1x1 pixel^2
  - ID: -5
  - Bits per pixel: 8 (grayscale LUT)
  - Display range: 0-255
  - No threshold
  - ScaleToFit: false
  - Uncalibrated
  - Screen location: 663,1013 (1920x1200)
  - SetMenuBarCount: 12 (0ms)
  - No properties
  - No overlay
  - No selection

– Histogramme d'une image



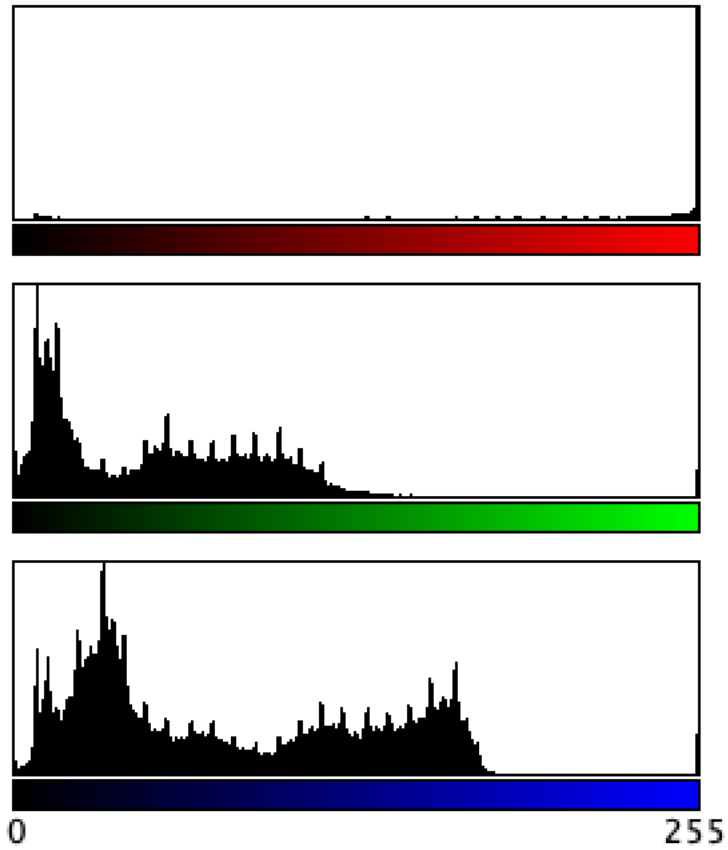
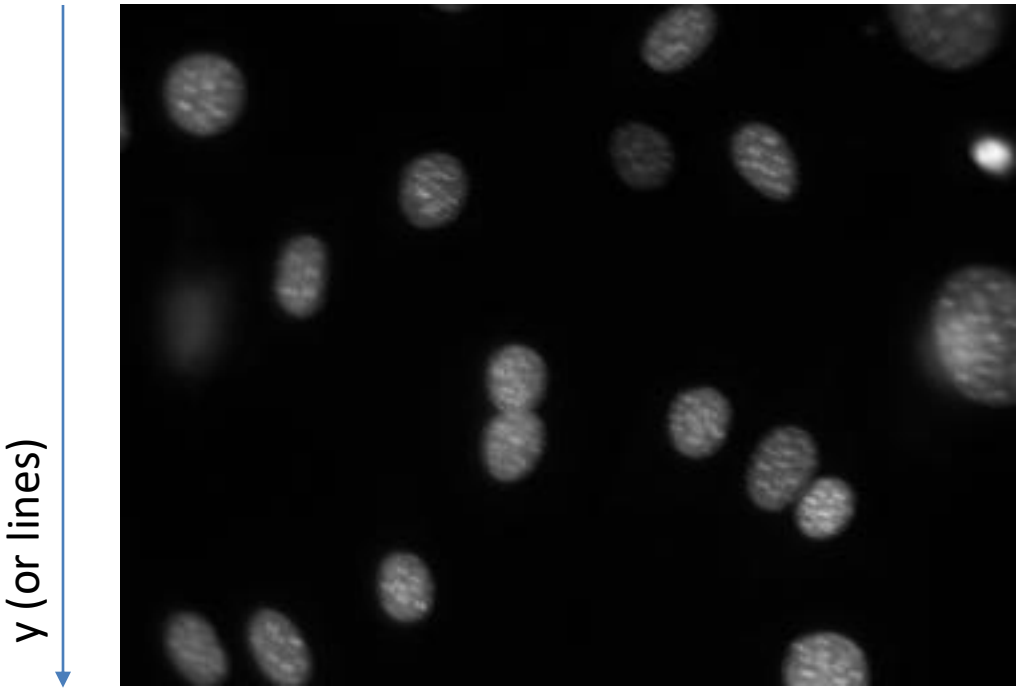


Image Representation

- Spatial domain



3D view of a 2D image (perspective view)

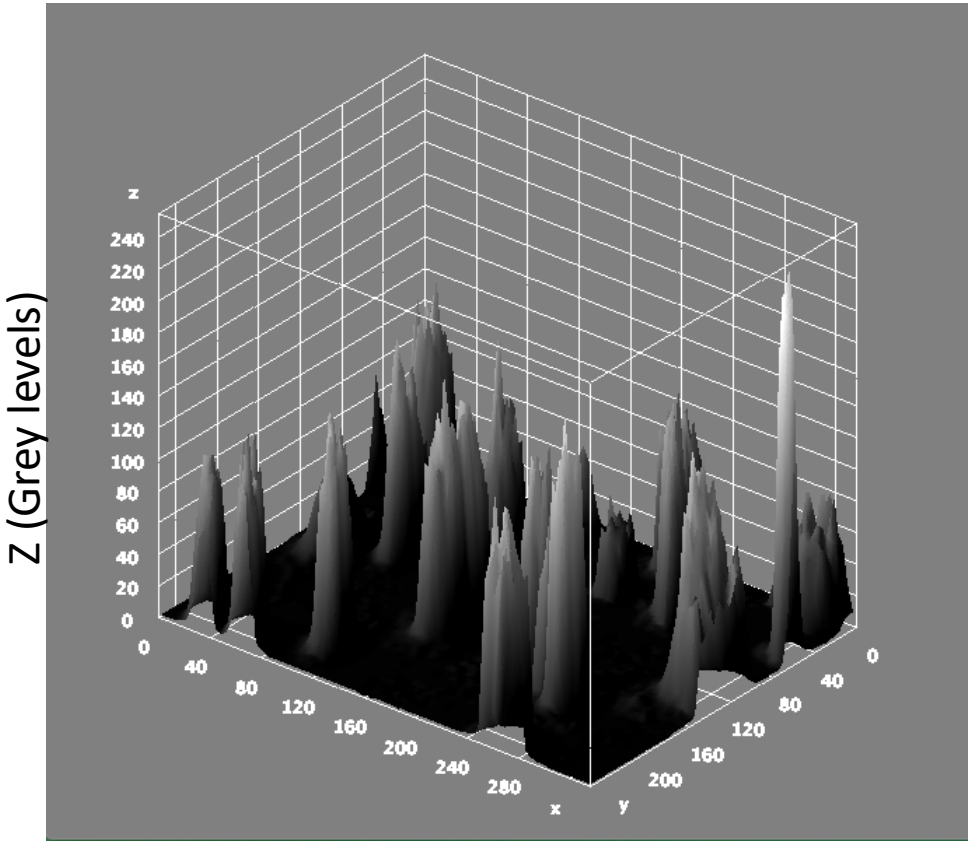
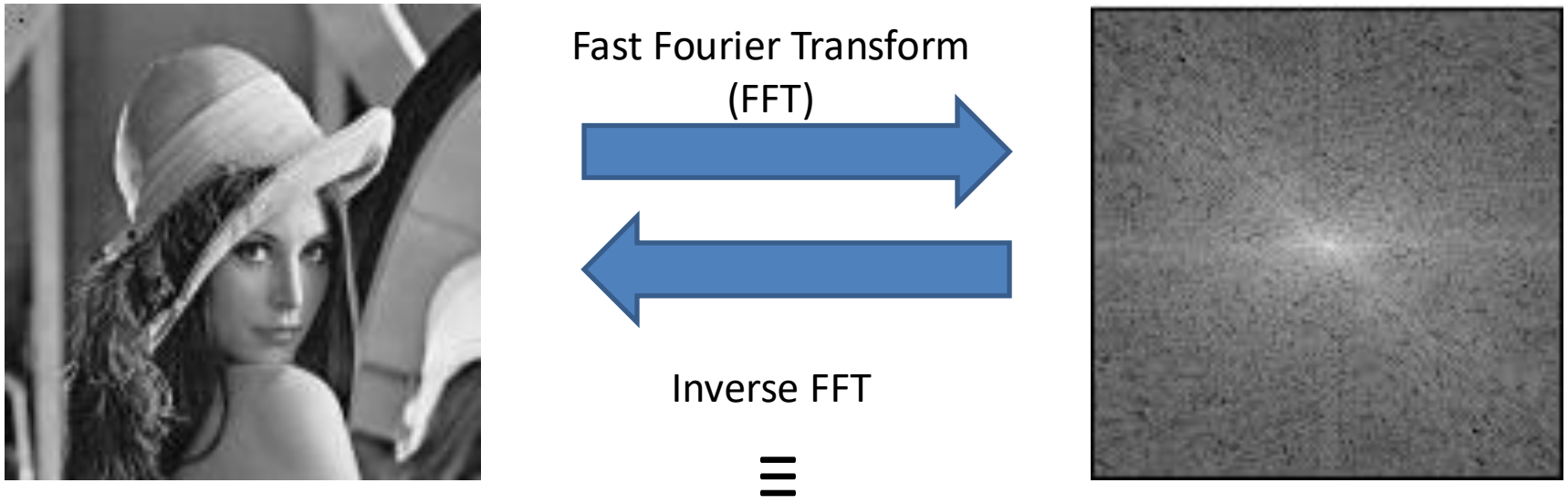


Image Representation

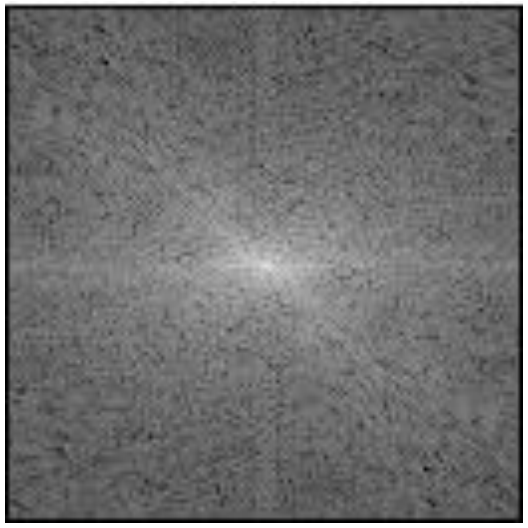
- Frequential domain



  - [Interpreting the Fourier Transform]

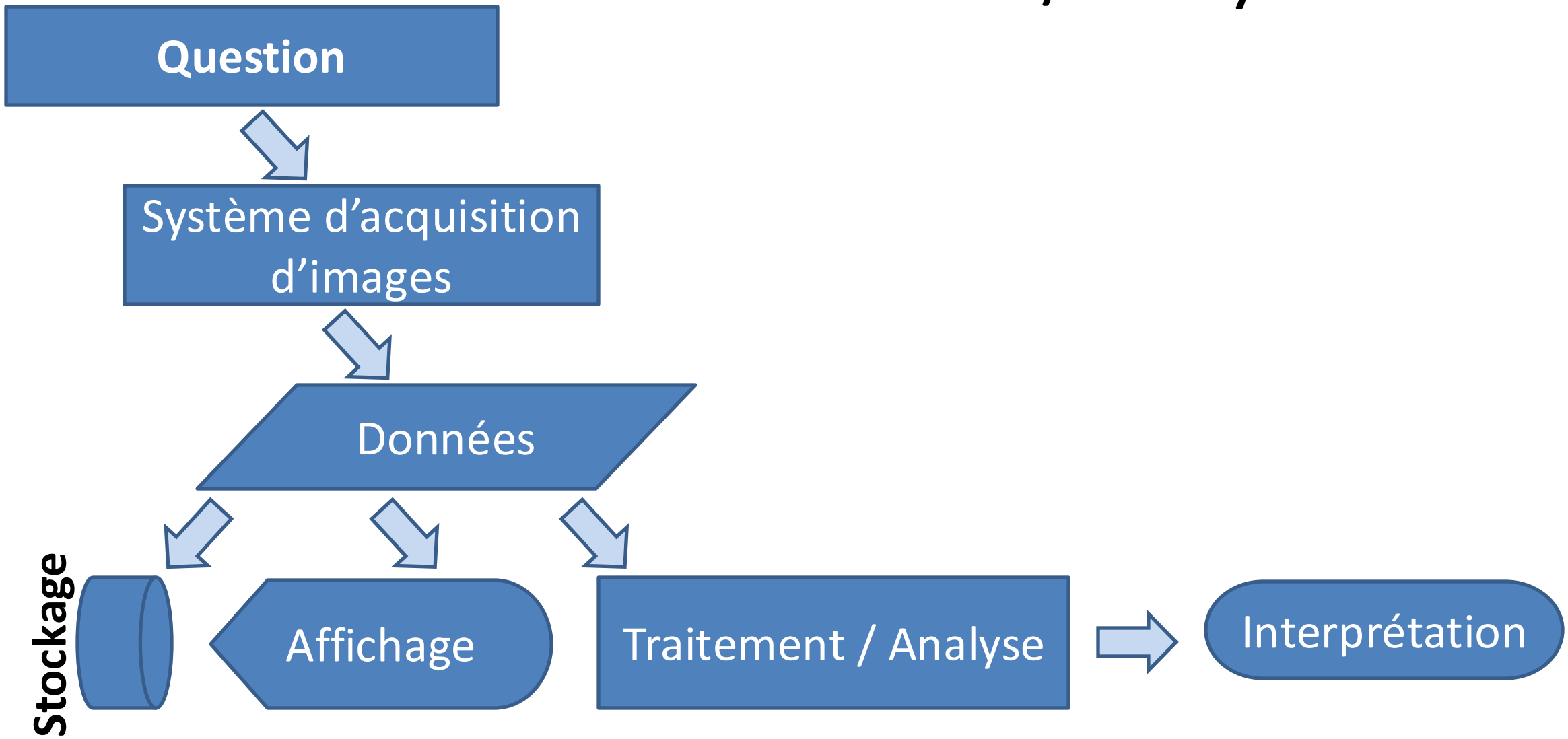
Other image domain transforms

Image Transform

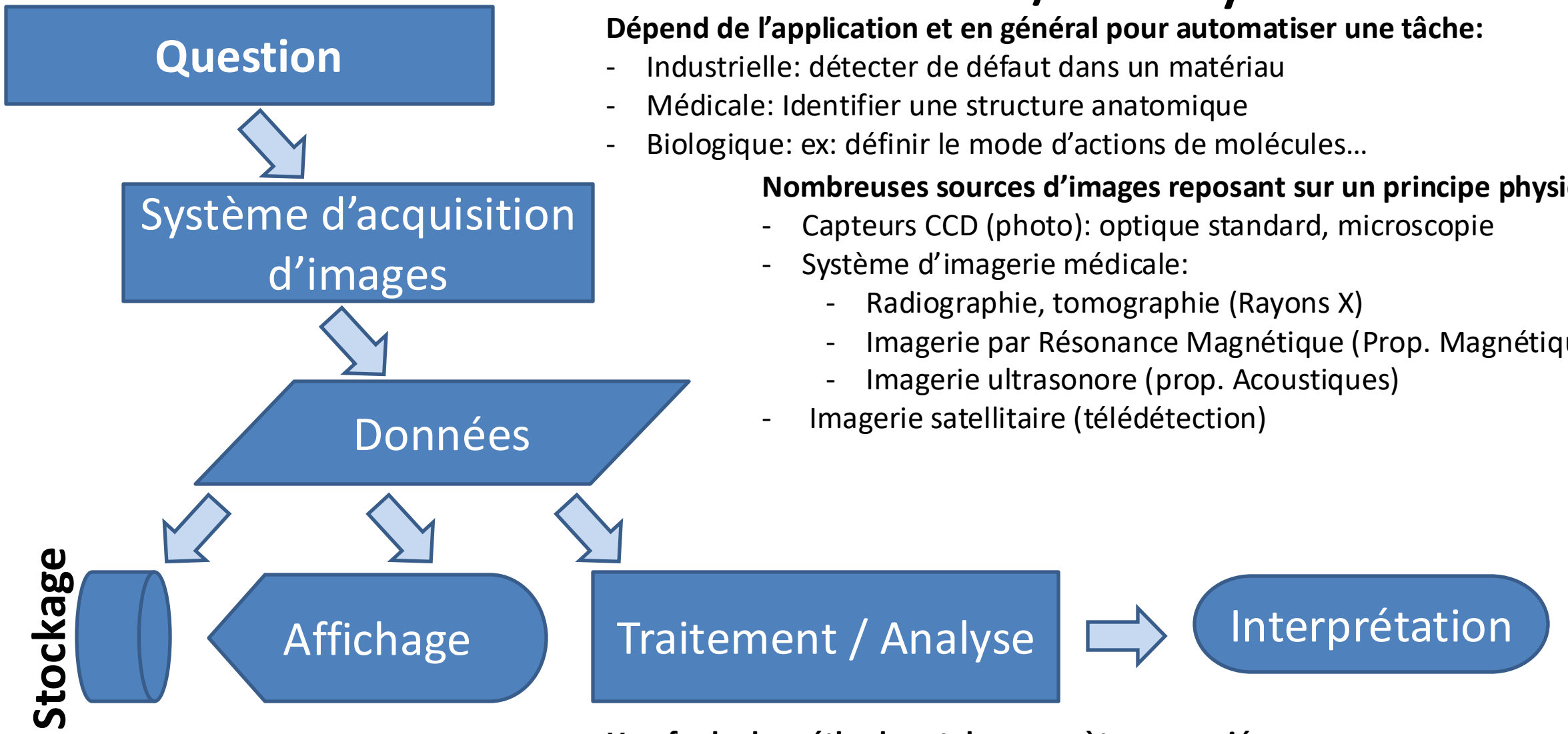


- Hough Transform, used to find lines in an image
- Radon Transform, used to reconstruct images from fan-beam and parallel-beam projection data
- Discrete Cosine Transform, used in image and video compression
- Discrete Fourier Transform, used in filtering and frequency analysis
- Wavelet Transform, used to perform discrete wavelet analysis, denoise, and fuse images

Chaine de traitement / analyse



Chaine de traitement / analyse



Dépend de l'application et en général pour automatiser une tâche:

- Industrielle: détecter de défaut dans un matériau
- Médicale: Identifier une structure anatomique
- Biologique: ex: définir le mode d'actions de molécules…

Nombreuses sources d'images reposant sur un principe physique

- Capteurs CCD (photo): optique standard, microscopie
- Système d'imagerie médicale:
  - Radiographie, tomographie (Rayons X)
  - Imagerie par Résonance Magnétique (Prop. Magnétiques)
  - Imagerie ultrasonore (prop. Acoustiques)
- Imagerie satellitaire (télédétection)

Une foule de méthodes et de paramètres associés

Traitement et analyse

- Image pre-processing
- Image Analysis
- La Morphologie mathématique
- Traitement d'images et apprentissage machine